

Applying functionally generated path to restore a terminal restoration in group function

Major Kyung S. Kim, DC, USA, and Captain Craig Neitzke, DC, USN

Introduction

Group function occlusion is sometimes beneficial in fixed prosthodontics.¹ Group function restorations are more clinically demanding than mutually protected occlusal schemes. When simplified instrumentation is used, semi-adjustable or straight line articulators, excessive adjustment is often necessary at delivery.² Fully adjustable articulators can be used, but these are time-consuming and errors can be incorporated if they are not used regularly.^{3,4}

The functionally generated path (FGP) is a simple concept for recording and using a precise pattern for occlusal and border movements.⁵ In 1933, Meyer⁶ described techniques that allow the dentist to use the patient's mandibular movement to carve an occlusal surface. Many authors have refined FGP methods.⁷⁻¹⁰ The original Pankey-Mann¹¹ technique relied on a functionally generated path to create a balanced occlusion.

The following technique is described in *Fundamentals of Fixed Prosthodontics*¹² and is typical of methods used to prepare FGP:

Prepare teeth and make a master cast. Make a wax tray over the prepared teeth on the master cast. Coat the tray's occlusal surface with a functional wax. Take the tray to the mouth and carefully seat it onto the teeth. Coach the patient to carve the soft wax with movements of his opposing teeth. Chill, box, and seat the tray onto the master cast. Fasten the master cast to an articulator. A simple hinge articulator may be used. Pour the boxed FGP and fasten it to the articulator. Wax prostheses into the stone FGP as desired. Cast the wax pattern, seat the metal prosthesis on the master dies, and refine the prosthesis to fit the stone functional path matrix.

Even though the FGP is a simple concept, it has a reputation for extreme technique sensitivity and difficulty.² Meyer,¹³ who first described the technique, said that "no adjustment of the occlusion in the mouth should be necessary if the technique is correctly carried out." However, in clinical practice, this goal is seldom achieved due to one or more of the following problems¹⁴:

1. Improper selection of the type of recording base or the careless recording of border movements on the functional wax table.
2. Mobility of the abutment teeth where the base does not provide adequate stabilization.
3. The optimistic expectation that the recording wax will capture in a few minutes all the variety of the functional movements, voluntary and involuntary, that the mandible can perform under the influence of varying degrees of muscle activity with its corresponding vertical displacement of the condyles.

The purpose of this Clinical Update is to describe a technique utilizing a provisional to work out the patient's occlu-

sion and create a custom guide table using an articulated provisional die as a functionally generated path.

Technique

1. Evaluate the patient's occlusal scheme and check for a group function occlusion (Fig. 1) before determining patient's final restoration design.



Fig. 1 Preoperative view of #31 in lateral excursion

2. Prepare the tooth for appropriate restorative space for the restoration of choice. Provisionalize the prepped tooth with Alike, polymethyl methacrylate, (GC America Inc., IL).
3. Follow-up is required to make adjustments as needed on the provisional restoration until both patient and clinician are satisfied with occlusal harmony of the provisional restoration in all eccentric movements. (Fig. 2).



Fig. 2 #31 Provisional in lateral excursion

4. Based on the evaluation of the provisional, make any modification required of the prepared tooth if thin areas are noted in the provisional material. Maxillary and mandibular alginate impressions are made. Make the final impression of prepared tooth. Make an interocclusal record (IOR) with Futar D, polyvinylsiloxane, (Kettenbach Dental, Germany). A Facebow transfer is made for semi-adjustable articulator (Whip Mix Corp, KY).

5. Pindex the mandibular cast with the provisional restoration, and the cast is then articulated using the IOR.
6. Remove all sections of the pindexed mandibular cast, except the die with provisional restoration.
7. Fabricate a custom guide table using auto-curing acrylic resin (GC Corporation, Japan). Place two denture packing plastic sheets to minimize abrading opposing casts (Fig. 3).



Fig. 3 #31 Provisional die articulated in MI.

8. Pindex and articulate the master cast.
9. Full contour wax-up. Check the excursive contacts using the custom guide table. Remove balancing contacts. Replace the rest of the master cast and check the protrusive contact.
10. Sprue, invest and cast the restoration. Seat the restoration on the articulated master cast and finalize the occlusal adjustments and polish (Fig. 4, 5).



Fig. 4 Occlusal view of #31 all metal restoration



Fig. 5 Completed prosthesis in lateral excursive

CONCLUSIONS

This method applies the procedure used by Hobo¹⁵ when restoring a single crown with an abnormal occlusion causing a

cuspal interference. This technique reduces adjustment time during delivery of the final restoration. More importantly, this procedure will determine if there is sufficient restorative space for the terminal abutment tooth using the provisional restoration as the guide before the final impression is completed. This procedure is useful for preserving occlusal harmony in terminal teeth with group function occlusions.

REFERENCES

1. Rhoads JE, Rudd KD, Morrow RM. Dental laboratory procedures: volume 2. St Louis; CV Mosby; 1986:140-1.
2. Curtis SR. Functionally generated paths for ceramometal restorations. *J Prosthet Dent* 1999 Jan;81(1):33-6.
3. Manary DG, Holland GA. Evaluation of mandibular movement recording and programming procedures for a molded condylar control articulator system. *J Prosthet Dent* 1984 Aug;52(2):275-80.
4. Winstanley RB. Observations on the use of the Denar pantograph and articulator. *J Prosthet Dent* 1977 38(6):660-72.
5. Bates JE, Nell DJ, Preiskel HW. Restoration of the partially dentate mouth. *Proceedings of the International Prosthodontics Symposium*. Chicago: Quintessence Pub Co Inc, 1982:49-54.
6. Meyer FS. A new, simple and accurate technique for obtaining balanced and functional occlusion. *J Am Dent Assoc* 1934 Feb;21(2):195-203.
7. Zimmermann EM. Modifications of functionally generated path procedures. *J Prosthet Dent* 1966 Nov-Dec;16(6):1119-26.
8. Schnader YE. The stone core intaglio in restorative dentistry. *Dent Clin North Am* 1981 Jul;25(3):493-510.
9. Dawson PE. Chapter 19: Functionally generated path techniques for recording border movements intraorally. I: Evaluation, diagnosis and treatment of occlusal problems. St. Louis, CV Mosby; 1974:248-74.
10. Eeckman J, De Boever JA. Clinical accuracy of functionally generated interocclusal registration waxes. *J Prosthet Dent* 1988 Nov;60(5):549-52.
11. Mann AW, Pankey LD. Oral rehabilitation utilizing the Pankey-Mann instrument and a functional bite technique. *Dent Clin North Am* 1959 Mar:215-30
12. Shillingburg, HT Jr, Hobo S, Whitsett LD. Fundamentals of fixed prosthodontics. Berlin: Quintessence Books; 1976:63.
13. Meyer SF. The generated path technique in reconstruction dentistry. Part II: Fixed partial dentures. *J Prosthet Dent* 1959 May-Jun 9(3):432-40.
14. Kafandaris NM. A modified functionally generated path technique for making maxillary posterior ceramometal restorations. *J Prosthet Dent*. 1981 Jul;46(1):29-31.
15. Hobo S, Takayama H. Oral rehabilitation: clinical determination of occlusion. Tokyo: Quintessence Pub Co Inc.;1997:85-90

Major Kim is a 2008 prosthodontic graduate at the Naval Postgraduate Dental School. Captain Neitzke is the Chair of the Department of Prosthodontics at the Naval Postgraduate Dental School, Bethesda, MD.

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